

Differences in the Media's Framing of Fracking/Shale Gas in New York, Pennsylvania, Germany, and the United Kingdom

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Executive Summary

Over the past decade, commercial mining firms in the United States have increasingly used horizontal drilling and hydraulic fracturing (fracking) to extract natural gas from shale rock formations (shale gas). The production of shale gas in the United States is booming: the percentage of U.S. domestic natural gas withdrawals from shale gas increased from 8.1% to 34.9% between 2007 and 2012, and U.S. wellhead natural gas prices dropped 57%. [1, 2] In contrast, Europe has not yet begun to produce shale gas on a commercial scale, even though EU natural gas prices are multiple times' more expensive than U.S. natural gas prices. Others have proposed various historic, economic, political, and geologic reasons for this disparity, but comparatively little attention has been paid to the hypothesis that differences in news coverage may have contributed to disparity, or even towards describing differences in news coverage. The question remains: have European news media outlets framed shale gas any differently than American news media outlets?

This paper presents the results of an original, preliminary inquiry into whether there exist differences in media framing of the shale gas/fracking in the U.S. versus the EU. A content analysis was performed on a representative sample of 712 fracking-related or shale gas-related texts from eight newspapers in New York, Pennsylvania, Germany, and the United Kingdom. All texts were published between January 1, 2007 and December 31, 2013. Ultimately, this study found significant differences in framing between the newspapers when analyzed individually ($p < 0.01$) and when grouped by state ($p < 0.1$). However, no significant differences in media frames were found between the shale-gas friendly jurisdictions (Pennsylvania & the United Kingdom) compared to shale-gas hostile jurisdictions (New York & Germany). Despite greater shale gas production in the U.S., the four U.S. papers on the whole were found to have presented a more negative frame towards shale gas than the four European newspapers ($p < 0.1$). These results provide evidence that media coverage of shale gas varies strongly by state and local jurisdictions, suggest that U.S. and EU media representations of shale gas are more similar than a casual observer might guess, and indicate that grand generalizations about media representations of shale gas in the U.S. and the EU are to be avoided.

Background – Reasons for Greater U.S. Production

It is clear that gas production has proceeded more quickly in the United States than in the European Union, and others have suggested at least four well-supported reasons for this disparity.

First, firms in the U.S. have had eleven years' head start. Hydraulic fracturing and horizontal drilling were developed in the United States. It was an American company – Mitchell Energy & Development – who deployed the first economically-feasible hydraulic fracturing technology, “light sand fracking” or “LSF”, in 1998, which then spread across the United States and into Canada. [3] In contrast, shale gas exploration work in Europe didn't begin until 2009. [3] As an additional consequence, more is known about the suitability of U.S. shale formations for shale gas development than EU shale formations.

Second, U.S. geology is more favorable to shale gas development. The largest formations in the EU have been estimated to hold 100-150 trillion cubic feet (Tcf) of technically recoverable shale gas. [4] In

contrast, the Marcellus shale of the northeastern U.S. is estimated to hold 369 Tcf of technically recoverable shale gas.[4] The Energy Information Administration (EIA) has also noted that early drilling results in Poland have been below expectations, and the shale geology of the UK is more complex than US geology.[4] Yet in spite of having what appears to be a relatively unfavorable geology, the EU still possesses massive shale gas reserves, and more recently estimated shale gas resources in the UK were revised upwards.

Third, differences in mineral rights ownership favor greater shale gas development in the U.S. A large percentage of the mineral rights in the U.S. are owned by private individuals and organizations who typically negotiate and receive direct payments for any mineral extraction from their mineral estates, including shale gas extraction. On the other hand, mineral rights in the EU are owned by EU member states, and direct payments for mineral extraction go to governments. Thus there exists a group of private individuals who can profit directly from shale gas development in the U.S. but no analogous group that can profit from shale gas extraction in the EU. Also, since it is normally easier to come to an agreement with a private individual or organization than a government bureaucracy, in theory the existence of private mineral rights in the U.S. has reduced the costs of negotiating mineral rights leases in the U.S. compared to Europe and allowed small oil and gas companies to be more competitive in the U.S. Crucially, most U.S. shale gas resources are located on private lands.[5]

Fourth, the U.S. has more capital, labor, and expertise available for shale gas development. The U.S. is home to large numbers of small and mid-sized petroleum firms, many of which were instrumental in pioneering economical hydraulic fracturing technologies. With thousands of wells already drilled across the U.S. compared to a much smaller number in Europe, the U.S. has more on-the-ground expertise and equipment that can be used for shale gas development.

On the other hand, some often-quoted reasons for more shale gas development in the U.S. are poorly supported. One questionable claim is that Americans are less concerned with shale gas's environmental effects than Europeans. Contrary to the popular stereotype of a universally risk-taking U.S. and a universally risk-averse Europe, in actuality the U.S. and different European countries adopt varying levels of risk management on different issues.[6] It is incorrect to assume that Europe is always more risk-averse than the U.S. on all issues. Regarding fracking specifically, a cursory look reveals a variety of approaches to shale gas within both the U.S. and the EU, from the actively motivated and involved (e.g., UK, Poland, Romania, Texas, Pennsylvania) to the cautious (e.g., New York, Ohio, France, Germany). This alone calls into question any blanket, over-simplified argument that Europe is more risk-averse than the U.S., even though that may hold true for specific countries.

Another uncertain claim is that residents in the U.S. are less opposed to onshore oil and gas development because such work has been happening in the U.S. for a longer time. It is certainly true that American citizens have been living with large-scale onshore oil and gas production for years, while most European citizens have not. The United States' first commercial oil was drilled in Pennsylvania in 1859, the state of Texas has been producing large amounts of oil and gas for decades, and many other states such as Oklahoma, Louisiana, and others are also heavily invested in oil production. In comparison, the largest oil

and gas fields in the EU are located offshore in places such as the North Sea, except for the Netherlands' Groningen gas field. However, some onshore oil and gas mining has been occurring in Europe for some time, for example at the United Kingdom's Wytch Farm oil field, Europe's largest onshore oil field. Also, Europe has a long history of coal extraction, especially in Germany, Poland, and the Czech Republic.

A third dubious claim is that there is less shale gas opposition in the U.S. because the U.S. has a lower population density than the EU. This reason makes sense intuitively because most local residents would not want to have a shale gas well drilled near their home given the non-negligible risk of pollution, and it is certainly true that the U.S. has a smaller population density than Europe. Yet numerous exceptions exist. For example, there exist cases of shale gas development and exploration in highly-populated areas. The Texas' Barnett Shale is the most developed shale in the United States with over 10,000 active horizontal wells as of 2010. It underlies Fort Worth, TX – a city of approximately 750,000 people – and Fort Worth's western surroundings. Numerous wells have been drilled within Fort Worth city limits, including on the grounds of Dallas/Fort Worth Airport.[7] (See Figure 1.)

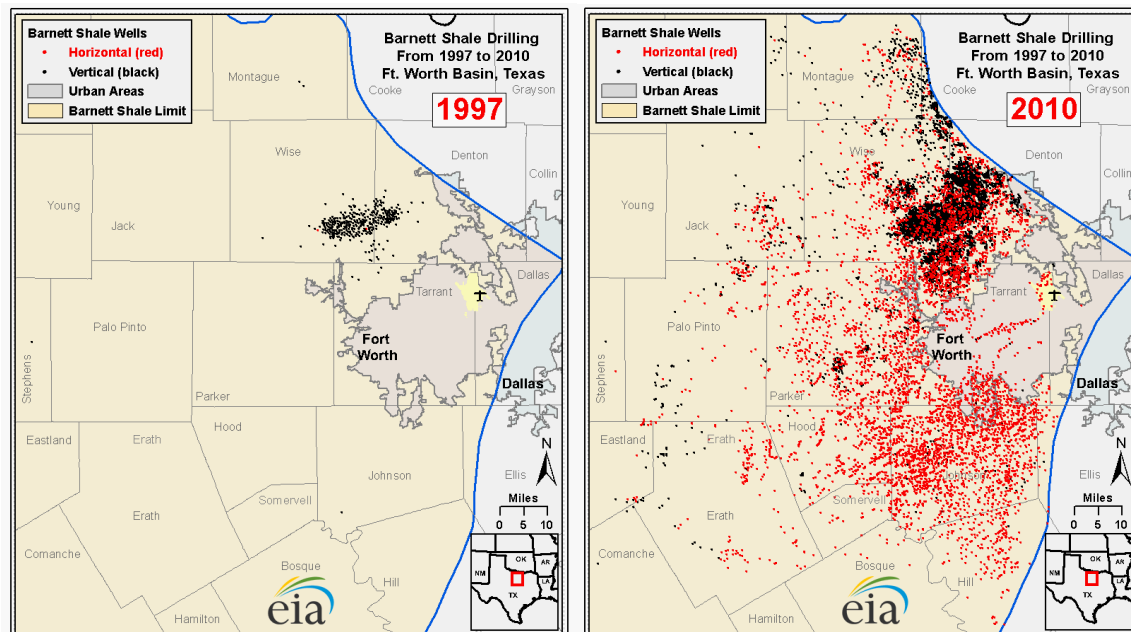


Figure 1: Shale drilling in Texas' Barnett shale near Fort Worth in 1997 versus 2010. A number of horizontal wells have been drilled within the Fort Worth city limits. (Source: EIA [4])

In the UK, one hydrocarbon exploration and production company, Cuadrilla Resources, drilled at least one exploratory well for petroleum in the Weald Basin shale near Balcombe, an area that is only 35 miles south of London.[8, 9] The UK itself continues to pursue a national pro-shale gas development policy even though most of Britain's assessed shale gas resources are located in shale deposits in northern England, on top of which sit the cities of Manchester, Leeds, Liverpool, and Sheffield.[10]

There also exist cases of moratoriums on shale gas development in sparsely-populated areas. For example, France has banned fracking despite having the second-most highest reserves in Europe according to the EIA's June 2013 study. Most of France's deposits are located in the Paris basin. While the Paris basin underlies the heavily populated city of Paris, it also underlies large areas of less-populated

rural France from Normandy south to the Loire Valley and east towards Alsace. (See “Pariser Becken”, Appendix 2, Figure 9.) Similarly, there is currently a moratorium on fracking in New York even though much of New York’s shale gas resources exist in the sparsely-populated western part of the state.

One final unconvincing explanation is that the U.S. Federal government has been more lax in its environmental regulations on fracking than has the EU government in Brussels. In reality, neither the U.S. Federal Government nor the EU government in Brussels has had much of a say in the regulation of shale gas development. Instead, shale gas development in the U.S. has been regulated by the states, and shale gas development in the EU has been regulated by EU member states. These points deserve further discussion.

While the U.S. Environmental Protection Agency (EPA) oversees various aspects of air quality, water quality, and wastewater disposal related to hydraulic fracturing, explicit exemptions applicable to shale gas development exist in numerous Federal environmental laws, and the 2005 Energy Policy Act introduced further exemptions into the Clean Water Act and the Safe Drinking Water Act.[11, 12] Various bills proposing to tighten Federal fracking regulations have been introduced since 2005, but all have failed to gain momentum, such as The Frac Act that would have required companies to disclose all chemicals used in fracking fluid. Members of Congress remain heavily divided on whether the U.S. government should enact a baseline level of regulations on fracking on environmental protection grounds.

In contrast to the lack of recent Federal action on hydraulic fracturing – and indeed, to help fill the void created by a lack of Federal legislation – lower levels of government have been extremely active in the regulation of shale gas development. Pennsylvania passed far-reaching shale gas-related legislation in 2012, and other important legislation has been passed in states like Ohio and Colorado. Meanwhile, some localities (e.g. Boulder, Colorado) and some states (e.g. New York) have imposed de facto or de jure hydraulic fracturing moratoriums.

Similarly, in the EU thus far it is the member states who have been solely responsible for developing their own shale gas development policies, as there exist no binding EU-level regulations on this issue. The EU’s most visible involvement so far has come from the European Commission, which has provided information on shale gas extraction and, on January 22, 2014, released a recommendation that invites member states to follow a set of principles when drafting or modifying legislation that affects shale gas development.[13] The recommendation is largely intended to help achieve baseline levels of fracking-related environmental and public health risk protections in the EU member states that pursue shale gas development. While the recommendation exerts some level of political pressure on EU member states and may herald additional EU-level action on this issue in the future, it remains non-binding.

In sum, the U.S. has been able to pursue its shale gas resources to a great extent and with great speed because a number of enabling factors coincided at the same time: new technology, physical capital, financial capital, human capital, a large resource base, a population relatively willing to accept hydraulic fracturing, and a property rights system allowing private landowners to collect payment for shale gas development on their lands.

So far, the EU has lacked many of those factors, but that is changing. The EU today increasingly possesses all of the same factors mentioned above that helped launch the boom in the U.S, including fracking know-how and physical capital. On the whole, there are two factors that the EU does not appear to possess to the same degree as the U.S. – property rights that benefit private landowners, which are unlikely to appear in the EU, and acceptance of fracking’s environmental risks, though as already mentioned there is plenty of variation on this throughout both the U.S. and the EU. Taking all of these reasons into account, the EU appears to currently have a greater chance to begin and increase its shale gas production than ever before. However, there is one additional force that may have also played an important role leading to different shale gas policy outcomes in the U.S. versus the EU: the media.

Media Framing – an Additional Reason?

Media scholars have proposed three ways that the media can affect public outcomes: agenda-setting, priming, and framing.[14] Agenda-setting occurs when the media brings issues to the public attention, making some issues more salient in the public consciousness. Rather than affecting *how* people think about an issue, agenda-setting affects *what* issues people think about. This effect has been discussed in the academic literature at least since 1972, when a published paper reported strong correlations between media coverage and voter campaign issue emphasis in Chapel Hill, North Carolina during the 1968 U.S. presidential campaign.[15] Priming occurs when the media associates a topic, such as an issue, candidate, or political party, with some other idea within the public consciousness. In other words, priming happens when the media “[shapes] the considerations that people take into account when making judgments about political candidates or issues.”[16] Finally, framing occurs when the media highlights or de-emphasizes various conceptions through its coverage of a topic, such as an issue, candidate, or political party.

There is convincing historical and empirical evidence that the media has affected actual political outcomes. Historical examples include Thomas Paine’s pamphlet “Common Sense” (1776), which is credited with helping to motivate colonial Americans to fight for independence from Britain. Contemporary examples also abound. For example, in the 1999 parliamentary elections in Russia, the presence of an independent TV station decreased voting for the government party by 8.9 percent.[17] As a second example, in the U.S. the introduction of Fox News was linked to an increase in the presidential vote share for Republicans in the 1996 and 2000 presidential elections, convincing 3 to 28 percent of viewers to vote Republican.[18] Clearly, the media exerts a real political force.

There is no definitive evidence that the media has affected political outcomes on fracking, but it is certain that the media has at least affected the public debate. First, there has been continuing media coverage about fracking on both sides of the Atlantic. In the U.S., the battle over the public image of fracking and shale gas has been highly visible in newspapers, on television, and perhaps especially in documentary films that in recent years have included two overtly political anti-fracking films, *Gasland* (2010) and *Gasland II* (2013), and the rebuttal pro-fracking film, *Truthland* (2012). Meanwhile, fracking has been widely reported on in various EU member states, such as in the U.K., especially during the Balcombe protests in southern England, and in France, which was home to many fracking-inspired protests.

Second, both fracking opponents and proponents have plainly attempted to frame the issue to their benefit, sometimes even using legal means to silence opposing viewpoints: in the U.S., environmental settlements and buyouts with homeowners following fracking-related environmental disasters have often come with gag orders that prevent victims from speaking about the incident. In one recent case, two children received a lifetime gag order against talking about fracking.[19]

Whereas the media can affect political outcomes and U.S. and European media have both widely covered fracking, content differences in the media coverage of fracking could explain some of the shale gas policy differences between the U.S. and the EU. Therefore, the purpose of this paper is, empirically, to investigate and describe the differences in the media's coverage of fracking in the two different polities.

This paper will specifically measure framing, rather than agenda setting or priming. First, an analysis of framing will be able to capture differences in media emphasis on the economic, environmental, social, and energy security-based aspects of fracking. Second, framing, which targets opinion formation as compared to agenda setting that aims to bring new issues to consideration, is appropriate to study since fracking is a relatively new technology, and its proponents and opponents have wanted to tilt public opinion to their side.¹ Third, framing is more easily measured and quantifiable for this purpose than is priming.

This project extends the work of Bomberg (2013) to include mass media coverage. The Bomberg study identified the framing strategies employed by pro-fracking and anti-fracking networks in the U.S. and the EU from an evidence base that included "statements, policies, news alerts and websites of key network members." [20] That study identified numerous similarities in the types of frames used by both American and European pro-fracking networks: both used frames on economic growth, energy security, and reassurance, while anti-fracking networks have emphasized the risk of shale gas development. But the study also identified important differences, namely that overall the pro-fracking frames were "more muted" in Europe than in the U.S. [20] The results of this study will describe the extent to which those frames carried over into the mass media, where they would presumably have a greater effect upon public opinion and possibly on political outcomes as well.

It should also be noted that just because the pro-fracking and anti-fracking networks in Bomberg (2013) were found to use frames that were largely similar, we cannot conclude that the same will be the case for media coverage. On some issues, U.S. and European outlets have been known to differ widely on media framing. For example, following the Fukushima nuclear disaster of 2011, three major U.S. newspapers primarily used three frames: conflict, responsibility, and economic consequences. [21] Meanwhile, two

¹ This brings up the secondary point that media firms themselves can experience incentives to change their message. Some of these incentives come from the "demand" side. If consumers demand entertainment over accuracy, the media has an incentive to distort the news in order to increase the amount of money and time that consumers are willing to spend on its product. Incentives to distort the news can also result from the "supply" side, such as the preferences of the owners of the media outlets, advertiser preferences, etc. (citation: DellaVigna, S. and M. Gentzkow, Persuasion: Empirical Evidence. Annual Review of Economics, 2010. 2(1): p. 643-669.)

Belgian newspapers, *Le Soir* and *De Standard*, framed the accident largely in terms of three different frames: proper information sharing, nuclear safety, and energy needs.[22]

Goals for this Analysis

The goal for this paper is to describe the differences between the media framing of shale gas in U.S. states versus EU member states. To do that, differences in the media's framing of shale gas development in four U.S. states and EU member states – Pennsylvania, New York, Germany, and the United Kingdom – were identified and quantified.

Data and Methodology

Site Selection

Two U.S. states and two EU member states were chosen for this analysis: Pennsylvania, New York, Germany, and the United Kingdom.

Pennsylvania and New York were chosen because of their broad similarities but obvious difference in shale gas policy. Pennsylvania has been an early promoter of shale gas and the largest producing state in the Northeast, while New York has issued a moratorium and continues to study the issue. Outside of shale gas policy, the states are largely comparable because both have large populations, contain large shale deposits in the same shale formation, support a mix of rural and urban areas, neighbor each other, and frequently lean towards electing Democratic policymakers.

Among EU member states, Germany and the United Kingdom were chosen because they have also pursued vastly different shale gas policies but are otherwise comparable on a number of levels. Germany has taken a very cautious approach to shale gas development, while the British government has publicly advocated shale gas development. Granted, the two countries have significantly different cultures, history, and systems of government. Yet they are roughly comparable in terms of population, income level, and mix of urban and rural areas.

Two newspapers were chosen from each of the four jurisdictions. They were specifically selected to account for geographic variability and partisanship. From Pennsylvania, the *Pittsburgh Post-Gazette* was chosen to represent western Pennsylvania, and the *Philadelphia Inquirer* was chosen to represent eastern Pennsylvania. Similarly, from New York the *New York Times* was chosen to represent eastern New York and the *Buffalo News* was chosen to represent western New York. From Germany, *Die Welt* was chosen to represent national newspapers, and the *Rheinische Post* was chosen because it is based in the German region of North Rhine-Westphalia, an area that is suspected to contain large shale gas reserves. From the UK, the *Daily Telegraph* was selected because it is known to have a rightward bias, and the *Guardian* was selected because it is known to have a leftward bias. Both papers are based in London.

Data

A Lexis Nexis Academic search of newspaper documents was performed for each of the eight newspapers. The search terms were “fracking OR shale gas OR unconventional gas OR unconventional natural gas OR hydraulic! fractur!” or, in the case of the German newspapers, “fracking OR schiefergas! OR unkonventionell! gas! OR unkonventionell! erdgas! OR hydraulic! fractur!”. The date range of the articles was from January 1, 2007 to December 31, 2013. The Lexis Nexis option “Duplicate Options: On - High Similarity” was used in order to filter out duplicate documents. Ultimately, the search returned a total of 5,343 results that included news articles, editorials, op-eds, letters to the editor, corrections, photo captions, and other types of documents. All of the documents were downloaded from Lexis Nexis Academic as word documents in batches of no more than 500 at a time. A spreadsheet listing of all of the documents was also downloaded.

To run a chi-square analysis, it is necessary that the expected total in each cell be at least five. To facilitate this goal, approximately 100 documents were randomly chosen from each publication, based upon the assumption that out of 100 documents the least frequent code would occur no less than 5% of the time (5 times). In all, a total of 785 documents of 5,343 were randomly selected to be included in the content analysis.

Publication	Documents Returned	Documents in Sample	Sampled (%)
Buffalo News (NY)	425	88	20.7%
New York Times (NY)	671	95	14.2%
Philadelphia Inquirer (PA)	460	108	23.5%
Pittsburgh Post-Gazette (PA)	1,584	109	6.9%
The Daily Telegraph (UK)	805	89	11.1%
The Guardian (UK)	413	96	23.2%
Die Welt (DE)	181	106	58.6%
Rheinische Post (DE)	804	94	11.7%
Totals	5,343	785	14.7%

Table 1: Number of documents returned from Lexis Nexis Academic, per publication, and sampled for use in the study.

Of the 785 documents in the sample, 100 were dropped based on if the mention of fracking was only a minor part of the article, included as a single cultural reference, or incidental to the point of the article; or, if the article was a duplicate of another article in the sample or only contained a small amount of text, such as a photo caption.² Of the 685 remaining documents, some included not one but multiple articles, such as multiple letters to the editor pertaining to fracking or shale gas. When one document contained multiple discrete articles, each discrete article was coded separately. The total number of “extra” articles resulting from this type of scenario was 27. In all, 712 articles were coded, with a minimum of 69 (*Rheinische Post*) and a maximum of 102 (*New York Times* and *Die Welt*) per publication. (See Table 2.)

² More specifically, decisions to drop a document from the sample were guided by four criteria. First, documents were dropped if they mentioned fracking only as a cultural reference embedded in an article that had little to do with energy, environment, or the politics thereof, or if shale gas/fracking was only mentioned in passing, and the connection between shale gas and/or fracking to the main idea of the article is tenuous and/or coincidental. Second, articles containing less than three sentences and fewer than 50 words were more likely to be dropped, especially if they were corrections of an earlier article. Third, articles only containing a photo caption were dropped. Finally, if the same article almost the same article was published multiple times on the same day, all but one of the articles were dropped from the sample. Duplicate articles published on different days were both left in the sample.

Publication	Documents in Sample	Documents in Sample Dropped	% Documents in Sample Dropped	Documents in Sample Kept	“Extra” Articles from Documents that included Multiple Articles	Total Articles in Sample Coded
Buffalo News (NY)	88	7	8.0%	81	0	81
New York Times (NY)	95	9	9.5%	86	16	102
Philadelphia Inquirer (PA)	108	10	9.3%	98	1	99
Pittsburgh Post-Gazette (PA)	109	16	14.7%	93	0	93
The Daily Telegraph (UK)	89	5	5.6%	84	10	94
The Guardian (UK)	96	24	25.0%	72	0	72
Die Welt (DE)	106	4	3.8%	102	0	102
Rheinische Post (DE)	94	25	26.6%	69	0	69
Total	785	100	12.7%	685	27	712

Table 2: The number of articles coded differed by publication.

Methodology

The methodological goal was to assign a theme/main idea to each article within the random subset of 712. To do that, a thematic coding scheme was developed on a batch of test articles from the *Denver Post*, and then refined as needed during the main analysis, when each article was assigned a single code encompassing what was judged to be its main theme. The possible thematic codes were *environmental risk*, *environmental harm*, *environmental benefit*, *economic growth*, *political or legal controversy*, *skewed or insufficient economic benefits*, and *fossil-fuel lock-in*, with sub-codes created for a subset. The sub-code *public health* was listed under *environmental risk*; the sub-codes *energy security benefit*, *technological prowess*, and *positive economic effect on EU economy from U.S. Shale Boom* was included under *economic benefit*; the sub-code *lobbying and corruption* was listed under *political or legal controversy*; and the sub-codes of *negative economic consequences from U.S.'s shale gas boom* and *negative economic consequences from possible shale booms elsewhere* were listed under the heading *skewed or insufficient economic benefits*. (See Appendix 1 for a complete list.)

To check coding stability, after the 712 articles were coded the 20 first articles coded from each publication were re-coded later for a reliability analysis.

Results

The primary result of this study was that wide variations in framing were found on the newspaper level, but when grouped by state (e.g., New York, Germany) or by greater political union (i.e., U.S. or EU) the differences faded. The implication is that the overall U.S. and EU media representations of shale gas are more similar than a casual observer might guess, and that grand generalizations about media representations of shale gas in the U.S. and the EU are to be avoided. To the contrary, the evidence here suggests that the greatest variations in media framing occur at the local level.

The eight newspapers included in the study varied widely on fracking support ($p < 0.001$; Figures 2&3). The most fracking-negative newspaper was *The Buffalo News*, of whose articles approximately 65%

employed a negative frame ($p < 0.01$; Table 3), compared to an average of 46.4% across the entire sample. This negativity was driven by a large percentage of articles about environmental risk or harm. The great concern over environmental risks in Buffalo may be due to the legacy of industrial pollution disasters in the area, such as the Love Canal fiasco that occurred in the nearby city of Niagara Falls. Love Canal was specifically mentioned in many of the *Buffalo News*' letters to the editor that were analyzed as part of this study.

In a result that might surprise the casual political observer, *The New York Times* was moderate in its framing of shale gas compared to the other papers in the sample. Despite its popular reputation as a progressive newspaper, it was the fifth-most-negative and third-most-positive towards shale gas of all of the eight publications listed in this study, and its proportion of negative articles (49%) was insignificantly different from the average of 46.4% (Table 3).

The second-most fracking-negative newspaper was *The Guardian*, which was approximately 60% negative. Interestingly, the other United Kingdom paper – *The Daily Telegraph* – was by far the most supportive of fracking, with about 60% of its articles using a positive frame ($p < 0.001$; Table 3). *The Daily Telegraph* ran the highest percentage of economic growth/environmental benefit-themed articles of any of the included papers. This result may not be surprising because the *The Daily Telegraph* is owned by Rupert Murdoch, a well-known conservative, and *The Guardian* is known as a progressive paper.

After *The Daily Telegraph*, *Die Welt* was the second-most fracking-positive paper with approximately 52% support ($p < 0.05$; Table 3) – this despite the German government's official prohibition of fracking until more environmentally friendly fracking fluids are developed. By contrast the other German paper, Düsseldorf's *Rheinische Post*, was perhaps closer to the official German position, with the largest percentage of neutral articles in the study, mostly due to frequent politically-neutral mentions of local political events on fracking and interviews with local officials. *Die Welt* carried a somewhat noticeably greater number of articles about energy geopolitics than the other papers in the study, except perhaps for *The New York Times*. Many of the *Die Welt* articles covered the effects of the U.S. Shale Gas Boom on Russia and Gazprom.

The Pennsylvanian newspapers *The Philadelphia Inquirer* and the *Pittsburgh Post-Gazette* were remarkably average in their framing of the issue: they were the 4th and 6th most negative out of the eight newspapers. (See Table 3.) That the Pennsylvania papers' frames were middle-of-the-pack and also similar to one another is perhaps surprising since shale gas development has happened faster in Pennsylvania than anywhere else in the U.S, especially to the northeast of Pittsburgh. However, not visible in the raw counts and percentages between the two papers are important local differences that were too specific to receive their own coding categories. For example, *The Philadelphia Inquirer* ran a significant number of articles reflecting the ongoing debate over whether taxes on shale gas should be increased in order to help support underfunded Philadelphia public schools.

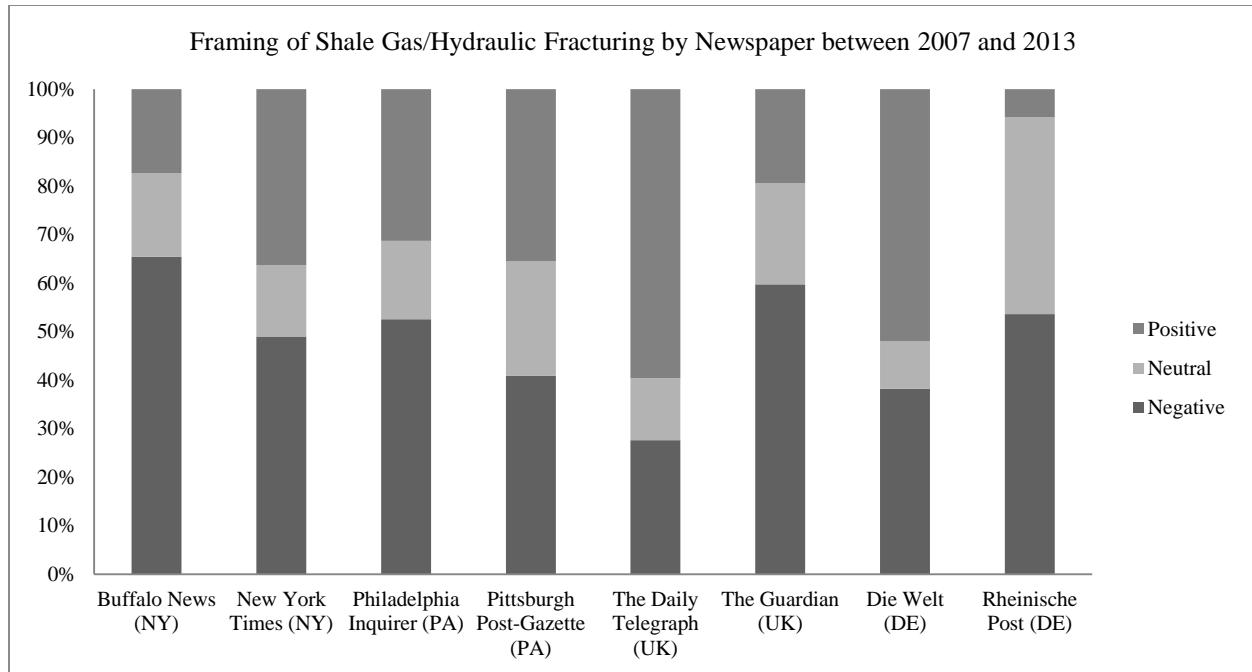


Figure 2: A chi-square analysis revealed there to be very significant differences in the proportions of positive, neutral, and negative articles about fracking among the eight publications. (Pearson $\chi^2(14) = 101.5308$ PR = 0.000.) This figure shows the percentage of articles receiving a code of negative, neutral, or positive for each publication, for all articles in the sample that were not dropped.

	Proportion of Negative Articles	Std. Error	95% Confidence Interval
Buffalo News	0.654**	0.053	(0.550, 0.759)
The Guardian	0.597	0.058	(0.483, 0.711)
Rheinische Post	0.536	0.060	(0.418, 0.655)
Philadelphia Inquirer	0.525	0.050	(0.426, 0.624)
New York Times	0.490	0.050	(0.393, 0.588)
Pittsburgh Post-Gazette	0.409	0.051	(0.308, 0.509)
Die Welt	0.382*	0.048	(0.287, 0.477)
The Daily Telegraph	0.277***	0.046	(0.186, 0.368)

*=significant at $p < 0.05$

**=significant at $p < 0.01$

***=significant at $p < 0.001$

Table 3: A two-sided binomial test revealed three publications to have proportions of fracking-negative articles that were significantly different from 50% at the 95% confidence level: *The Buffalo News*, whose articles were more anti-fracking, and *The Daily Telegraph* and *Die Welt*, whose articles were more pro-fracking. Analytic standard errors were assumed.

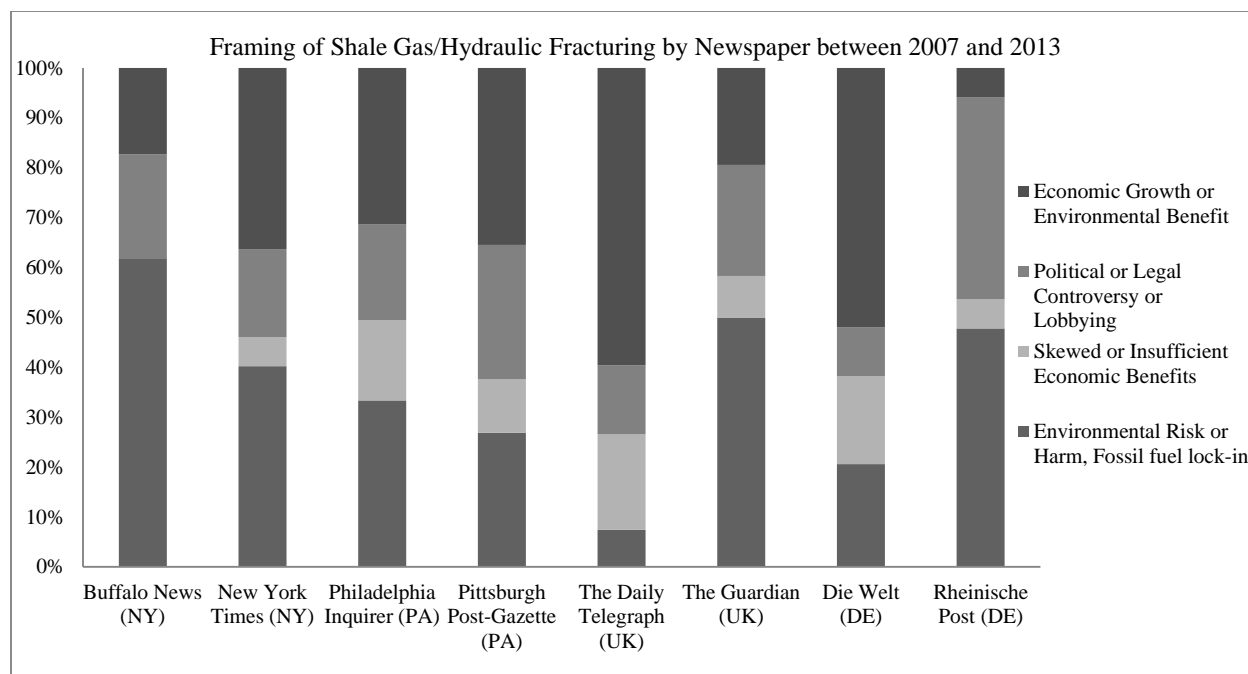


Figure 3: The eight publications differed significantly in content: The Buffalo News emphasized environmental risk/harm; The Daily Telegraph emphasized economic benefits at the expense of environmental risk/harm; and in The Rheinische Post there was less talk of economic benefits in favor of more talk of political or legal controversies or decision-making. (Pearson $\chi^2(21) = 159.1341$ $PR = 0.000$.)

A second aim of this investigation was to determine whether shale gas framing differs by jurisdiction. While the study cannot answer this question definitively because random statewide samples of articles were taken only at the level of the eight specific newspapers, some possible evidence of state-level differences was found ($p < 0.1$; Figure 4) with counts pooled at the state level. In particular, more negative frames used by the New York newspapers, more neutral frames used by the German newspapers, and more positive frames used by the British newspapers. The state-level pooled data also provide some possible evidence for a link between negative framing and anti-shale gas policies. In the U.S., the two newspapers from shale gas-cautious New York were more negative on shale gas than the two newspapers in shale gas-friendly Pennsylvania. In the EU, the two newspapers from pro-fracking United Kingdom were more positive on shale gas than the two publications from Germany, whose official position on fracking is driven by caution. (See Figure 4.)

However, these inter-jurisdictional results should not be overstated. They are weak (no results significant at $p < 0.05$; Figures 4-6) compared to the differences between the papers *within* each jurisdiction ($p < 0.001$; Figure 3). On the positive/neutral/negative scale, differences between the two German publications was significant at $p < 0.001$, as were differences between the British publications. The analogous differences among the Pennsylvania publications and among the New York publications were both significant at $p < 0.05$. Using the negative/non-negative scale, significant differences at the $p < 0.05$ level were found within all jurisdictions except for Pennsylvania, where no significant differences were detected. The differences in the framing of fracking according to the non-negative scale were especially apparent between the two UK publications ($p < 0.001$).

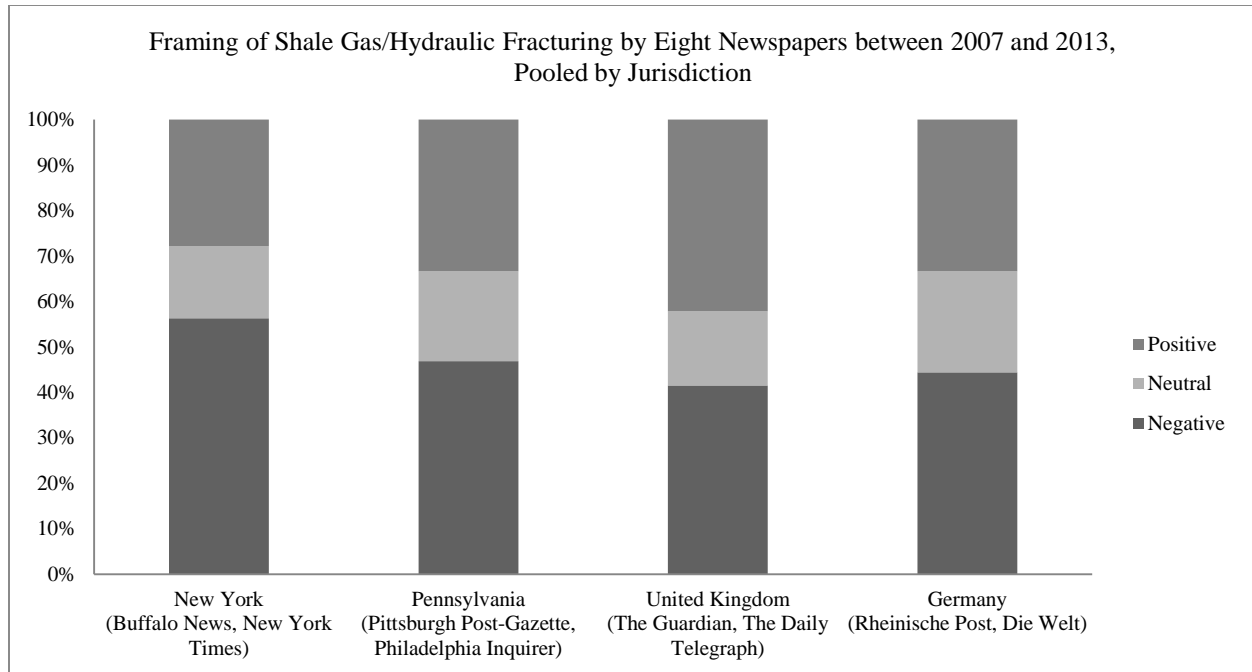


Figure 4: A trend towards a difference in framing was detected with newspaper articles pooled at the state level. (Pearson $\chi^2(6) = 12.4801$ $PR = 0.052$.) This figure shows the percentage of articles receiving a code of negative, neutral, or positive for each publication pooled by jurisdiction for all articles in the sample that were not dropped.

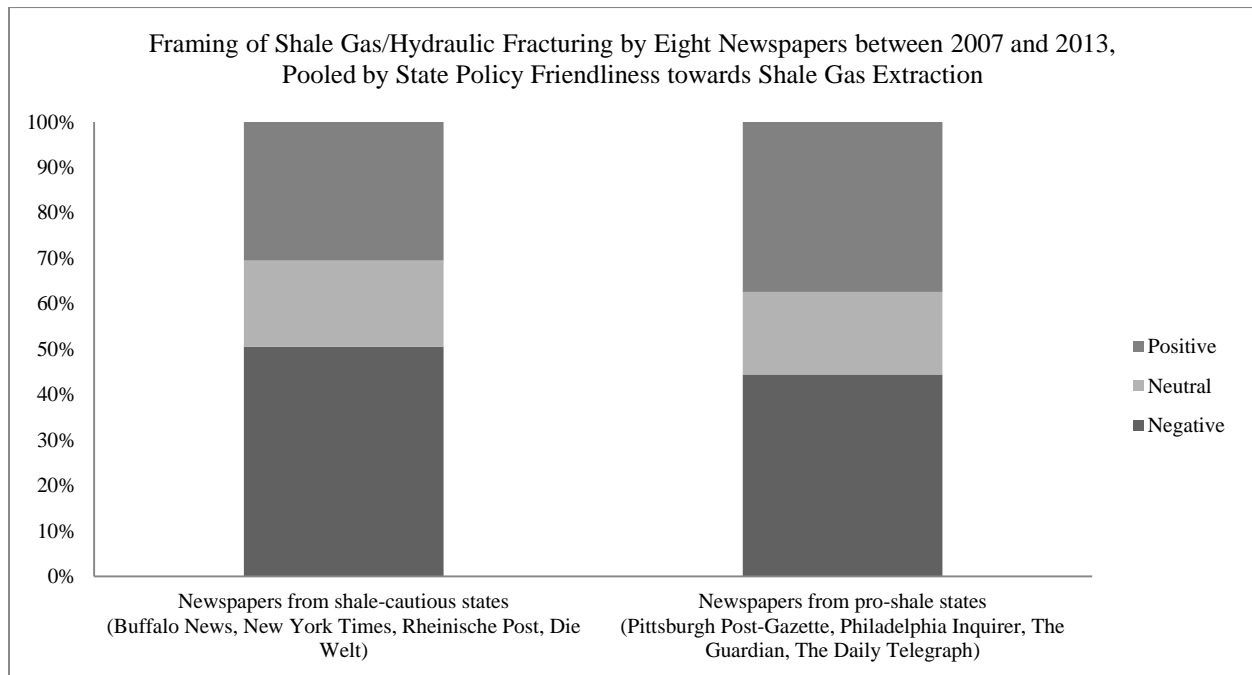


Figure 5: No significant difference in framing was detected with the articles pooled by state policy friendliness towards shale gas extraction. (Pearson $\chi^2(2) = 3.9848$ $PR = 0.136$)

Most meaningfully, perhaps, no evidence was found that the U.S. papers on the whole were any more positive towards shale gas than the EU papers. If anything, the EU papers employed a trend toward a slightly more negative frame ($p < 0.1$; Figure 6). This was unexpected: while the newspaper articles in this study were not a random sample of all of the articles printed on the subject in the two greater jurisdictions, efforts were made to choose geographically-diverse and ideologically-balanced papers from each of the four states. Conceivably, if there were a large difference in framing between U.S. newspapers and the EU newspapers on this issue, it would have shown up here.

That no great difference appeared suggests some level of similarity between the U.S. and the EU on this issue and imply that one should be careful not to make U.S.-level or EU-level generalizations about shale gas media coverage, at the very least. But we can expand that conclusion and say that one should be careful not to make U.S.-level or EU-level generalizations about shale gas, given the differences in history, culture, geology, economy, and other aspects of life that exists between states and localities. The vastly different production figures of 2012's four top shale gas-producing states (Figure 7) provide further evidence that one really cannot make a generalization about U.S. shale gas on the whole.

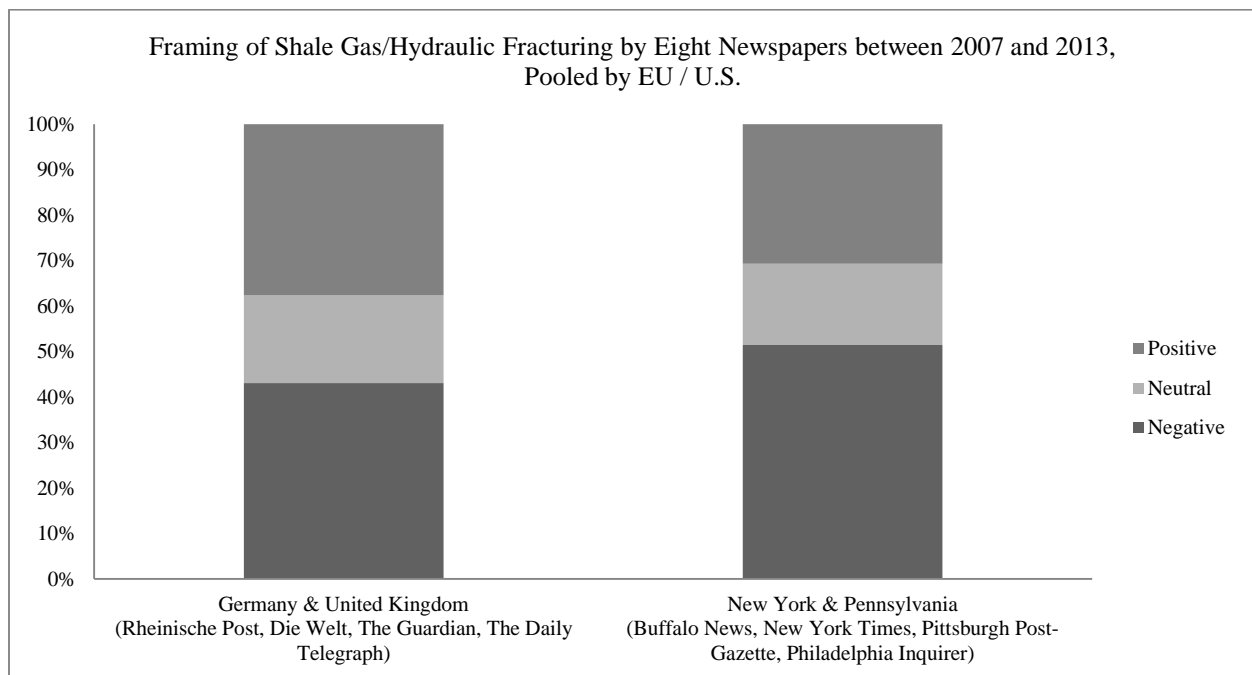


Figure 6: A trend towards a difference in framing was detected with the articles pooled at the national/supranational level. (Pearson $\chi^2(2) = 5.4293$ $PR = 0.066$.)

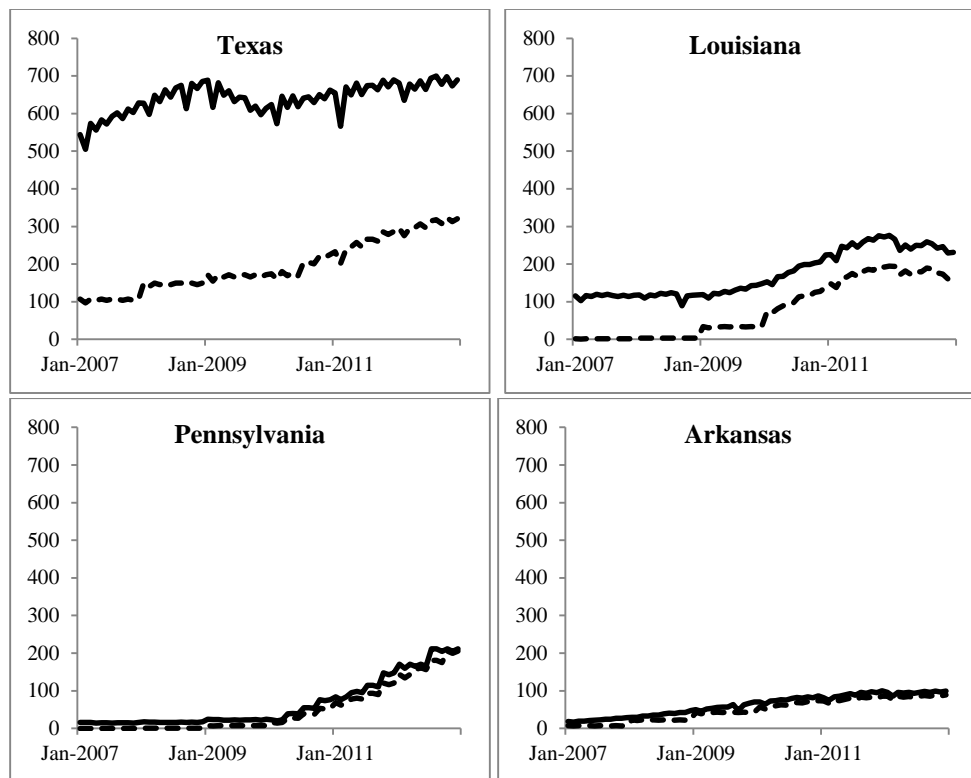


Figure 7: These graphs present total gross natural gas withdrawals and production (solid line) and shale gas withdrawals and production (dotted line) in billion cubic feet (Bcf) in four leading U.S. shale gas-producing states from January 2007 to December 2012. (Source: EIA [1]) Shale gas development has clearly proceeded differently in each of these four states, which is visual evidence that U.S. state-level variation in shale gas development should not be ignored.

Robustness Checks and Limitations

Before performing the chi-Square tests, it was verified to the extent possible that the assumptions underpinning chi-Square tests were fulfilled: the data came from a simple random sample, total sample size was adequate, and the expected cell frequency was greater than 5 in each. The assumption that the observations are independent of one another could not be verified and was likely violated to some extent, given that events such as the Balcombe fracking protests in the UK or the release of the Matt Damon movie *Promised Land* might have provoked similar coverage of fracking in multiple publications. However, the author believes that this assumption was not violated substantially because much of the fracking coverage in each of the publications was locally-focused.

A coding stability check was performed in order to assess the reliability of the results.³[23] Coding stability was estimated to be 78.6% (31 mismatches) for the base codes, 87.6% (18 mismatches) with article codes collapsed as negative/neutral/positive [towards fracking], and 90.3% (14 mismatches) with article codes collapsed as negative/non-negative. The coding stability check also revealed that 9 of the

³ Coding stability was determined to be the highest measure of reliability feasible for this study. The two higher measures of reliability – reliability across persons and adherence to a peer-reviewed coding standard – were not possible in this study because the author was the sole coder with no other coders' work and no published, third-party standard to measure against.

173 articles were dropped in the main dataset but not the verification dataset, implying a 94.8% accuracy rate on dropping articles.⁴

This study included a small number of deliberate methodological limitations. First, only two U.S. states and two EU member states were included in the analysis. As a result, some of the variation in media framing among U.S. states and EU member states was omitted from this study. Second, each article was assigned only one thematic code, which brought simplicity but also meant that other themes present in any given article were not accounted for in the analysis. Arguably, this concern is minor with respect to this study because newspaper articles frequently only have one main point or idea. Third, it is possible that some meaning in the 200 German-language articles was lost or misinterpreted because the author is not a fluent German speaker, although translation software reduced this risk by a considerable extent. Fourth, this method of analysis implicitly assumed that each document and newspaper was equally important to the framing of fracking/shale gas, which might not be true. For example, front page articles may have had more of a chance to “frame” the fracking debate than articles on page 20, and some papers may have more clout than others. Lastly, newspapers are not the only source of information for citizens, and therefore analyzing framing in newspapers alone may not capture differences in framing present in other media formats such as broadcast television, cable television, and radio.

Next Steps

This study begins to fill a gap in the study of political communication on shale gas and can be used as background information for those wishing to understand more about how this issue has been presented on both sides of the Atlantic. As noted previously, the main lessons learned were that variability in media framing of an issue occurs on *local* levels, and that one should be careful not to generalize about shale gas framing and other aspects of shale gas on a continent-wide level, unless they make specific sense as aggregate statistics, such as production statistics.

One question that remains is: to a greater degree of accuracy and precision, does shale gas media framing differ systematically on a U.S.-wide or EU-wide level? The present study provides a first step, and to build on it further study could include media outlets from a larger number of EU countries and states, further refine and improve upon the codebook developed here, and aim for a higher stability rate. If possible, it would help to develop a standard codebook for texts on shale gas development. Another improvement would be to take a random sample of all of the articles within a jurisdiction, perhaps weighted by readership, instead of looking at articles in a small number of publications and weighting them all equally.

Another possible next step is to integrate the information from this study into a series of representative case studies on why shale gas has been pursued in some U.S. states and not others and in some EU member states and not others. Content analysis methods alone – including the content analysis performed here – cannot reveal why politicians make the decisions that they do, but they can reveal media effects that play into political decision-making. Data from this study and other studies on political

⁴ Specifically, four articles that were dropped in the master dataset were not dropped in the verification dataset, and five of the articles that were dropped in the verification set were not dropped in the master dataset.

communication could be used to supplement process-tracing-based case studies on shale gas decision-making.

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Appendix 1: Codebook Developed by the Author for Content Analysis

Code#	Structural Code Name	Positive, Neutral, or Negative versus fracking	Full Definition
10	Environmental Risk	Negative (-1)	An article whose message about fracking or shale gas primarily concerns the risks that fracking or shale gas MIGHT or WOULD present to the environment and/or public safety, including surfacewater pollution, groundwater pollution, loud noises, bad smells, or climate change exacerbation. The risks may be mentioned in connection with the development of environmental regulations, such as the minimum distance that a fracking well must be from a house. The risks might also include mentions of public safety or tertiary risks such as a decrease in public support of (or public funding for) carbon capture projects.
10.1	<i>*subcategory: Public Health</i>	Negative (-1)	An article whose message about fracking primarily concerns the risks that fracking MIGHT or WOULD present to public health, via its negative effects on the environment. Articles receiving this code speak of the environmental risks of fracking but only within the context of their effects on human health. The primary focus is fracking's effects upon human health.
10.2	<i>*subcategory: Fossil-fuel lock-in</i>	Negative (-1)	An article whose message about fracking primarily concerns the idea that deciding to frack encourages a reliance (perhaps over-reliance) on fossil fuels and will ultimately slow the switch to a more-renewables/all-renewables energy mix. It may include references to shale gas not being a long-term energy solution in contrast to renewables, or to shale gas not doing anything to solve the problem of "peak oil" or other future disruptions in fossil fuel supply. This topic also includes articles that state that the shale boom had retarded the growth of renewable energies, which has been bad for climate change prevention; both a renewable energy mention and a climate change mention are necessary.
20	Environmental Harm and Reparations	Negative (-1)	An article whose message about fracking primarily concerns the effects that fracking HAVE ALREADY (or SUSPECTED TO HAVE ALREADY) presented to the

			environment, including surfacewater pollution, groundwater pollution, or landscape change. The article may discuss environmental harms that have already occurred or investigations into possible environmental harms. There may be some mention or discussion of what monetary compensation is necessary for victims of that environmental harm.
30	Environmental Benefit/Benignness	Positive (1)	An article whose message about fracking is primarily that it does not cause significant environmental harms, or that it WOULD NOT CAUSE HARMS given certain conditions (i.e., non-toxic fracking fluids, etc.), or that the environmental harms that it causes are less than the next best alternative energy source to fracking. This category also includes articles whose main idea is that since petroleum development (not fracking but other types) has been done safely in an area in the past, fracking is also safe.
40	Economic Growth/Benefit	Positive (1)	An article whose message about fracking primarily concerns the economic growth that fracking produces, including references to shale gas as a way to satisfy energy and resource demands. The article may include mentions of private sector investments, new jobs created or new people hired, new shale gas lease agreements, and/or bidding on shale gas lands or infrastructure. The benefits of fracking may be contrasted with the relative disadvantages of pursuing other types of energy. Or, the article may refer or allude to the fracking boom as an example of something large, consequential, and booming, with no mention or comparatively little mention of the downsides. The article may also refer to economic benefits, including tax dollars from shale gas production, successfully reaching communities where shale gas production is occurring.
40.1	<i>*subcategory: Energy Security Benefit</i>	Positive (1)	An article whose message about fracking primarily concerns the energy security that fracking brings, or a change in geopolitical energy security calculations that have resulted from the U.S. Shale Boom. This category also includes articles whose primary mentions of fracking/shale gas is about "energy independence."
40.2	<i>*subcategory: Technological Prowess</i>	Positive (1)	An article whose message about fracking primarily concerns the technological prowess needed to frack successfully, new technology under development, new applications for known technology, or the research efforts that led to the development of commercially-deployable hydrofracking and horizontal drilling technology.
40.3	<i>*subcategory: Positive Economic Effect on EU/Western Economies from U.S. Shale Boom</i>	Positive (1)	An article whose message about fracking is primarily that an EU economy has benefitted from the U.S. Shale Gas Boom, most likely via a decrease in coal prices. Or, an article whose message about fracking is that an EU economy could benefit from the U.S. shale boom if the U.S. increased LNG exports.
50	Political or Legal Controversy	Neutral (0)	An article whose message about fracking is primarily that the public, politicians, judges, civil servants, and/or citizens are divided or gridlocked over it -- either 50/50 or in some other proportion -- with comparatively little mention, or no

			<p>net positive or negative mention, of the risks, costs, or benefits of fracking/shale gas. This message may occur with respect to fracking in general or with respect to a single fracking-related bill or issue, such as a natural pipeline approval process in PA, or an announced decision by a shale gas guy at an info session not to frack in North Park, PA.</p> <p>***Advertisements for fracking information sessions, including local information sessions or Congressional hearings or even museum exhibits, could fall under this category as long as they lack biased language towards shale gas/fracking. ***Notices about how jurisdictions (e.g., towns, states, countries) have regulated/are regulating fracking, or about how those different types of jurisdictions are fighting over political control over the process, also fall under this category as long as they lack biased language (i.e. speak neutrally) towards shale gas/fracking itself. ***This section might also include inflammatory mentions of areas where fracking is occurring or could occur but make no judgment on fracking itself. *** This category will also include unbiased, journalistic reporting on fracking protests. ***This category will also include articles that primarily discuss tactics used in the shale gas debate, such as accusing industry of framing the debate on fracking/shale gas, to the detriment of the facts. ***This category also includes mentions of disputes and disagreements about published findings in a government report, such as an EPA report, that a place has or has not been polluted to some extent, where the main topic of the article is the clearly the dispute and not the pollution, with the language referring to the pollution mentioned only in terms of the dispute. ***This category also includes notices that the EPA or some other place will begin a study of the effects of fracking in a place, as long as the mention is not surrounded by language that would bias the reader's opinion of fracking (e.g., on net support the idea that fracking has an environmental risk, an economic benefit, etc.).</p>
50.1	<i>*subcategory: Lobbying or Corruption</i>	Negative (-1)	<p>An article whose message about fracking primarily concerns levels of political support (e.g., campaign donations, jobs for former political officeholders or their staff, etc.) by the fossil fuel industry in support of a political cause or political candidate, or attempts to regulate campaign donations from those interests. This category also includes articles whose main message about fracking are messages from a non-fossil-fuel-industry group taking a stand about fracking in the context of a political race, or about a non-fossil-fuel-industry group running afoul (or potentially running afoul) of lobbying laws.</p>
60	Skewed or Insufficient Economic Benefits or Tax Disputes	Negative (-1)	<p>An article whose message about fracking primarily concerns the fact that fracking's economic benefits are not distributed equally within society. ***This category includes articles -- with fracking/shale gas messages more normative than positive -- that are primarily about profit sharing and how much money a government or locals might make from</p>

			normal fracking/shale gas operations (i.e., compensation for crises not included), including from taxes. ***This category also includes articles whose mention of fracking/shale gas primarily includes concerns or suspicions that any profits from fracking/shale gas production and/or processing might be moved to a different jurisdiction, perhaps a low-tax jurisdiction, and deprive local or national residents of the benefit of those funds. ***This category also includes primarily arguing or suggesting or implying that fracking shouldn't be undertaken in a location because it seems that the economic benefits are too small, or that fracking in a given locale has been insufficiently profitable or unprofitable, that the symbolic or historical value of the land is too high, or that the effects of fracking would bring too much harm to another industry. ***This category also includes articles whose primary mention of fracking is that the long-term production from fracked wells may be less than some have expected, or that costs (e.g. wastewater disposal costs) are very high. ***This category also includes articles primarily arguing that fracking/shale gas have NOT increased energy independence or energy security. ***This category also includes articles stating that economic indicators associated with fracking are decreasing, such as a shrinking number of jobs in the sector.
60.1	<i>*subcategory: Negative economic consequences from U.S.'s shale gas boom</i>	Negative (-1)	An article whose message about shale gas is primarily that the shale boom in the U.S. has had negative economic effects, or is predicted to have negative economic consequences, in another locale (e.g. a European country or a non-shale-gas-producing U.S. state) through the U.S. shale boom's effects on national or global energy markets, investment flows, or trade flows.
60.2	<i>*subcategory: Negative economic consequences from POSSIBLE shale booms elsewhere</i>	Negative (-1)	An article whose message about shale gas is primarily that an expansion of the shale boom beyond North America may have negative economic consequences in another locale (e.g. Russia) through its effects on global energy markets, investment flows, or trade flows.

Appendix 2: Shale Gas Maps

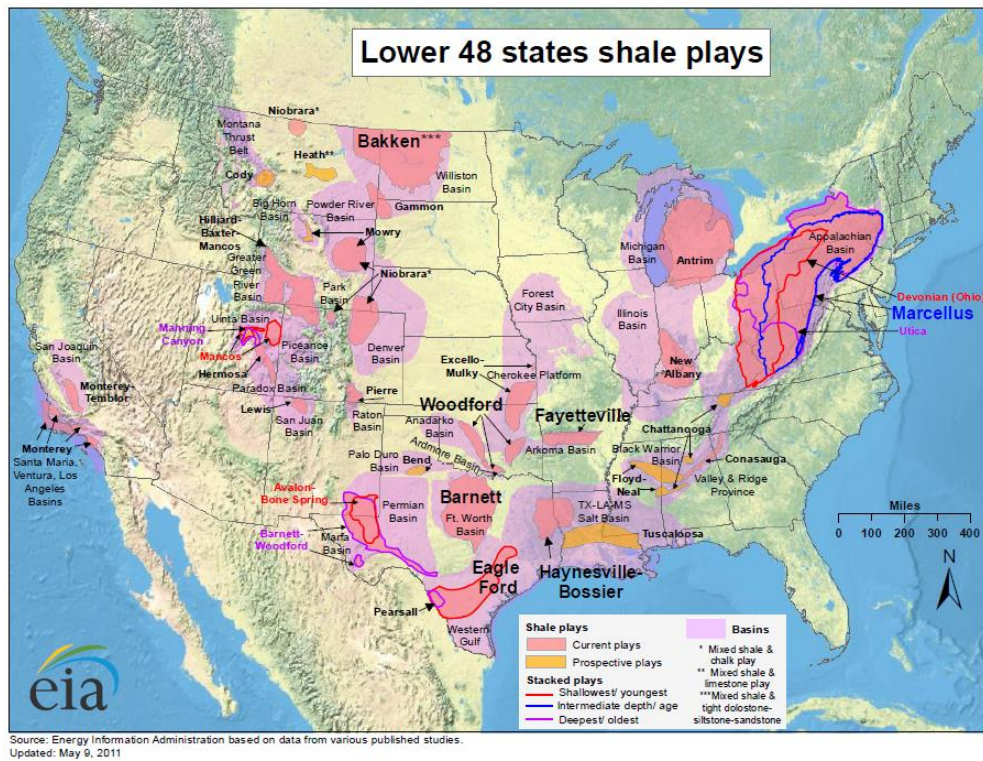


Figure 8: Map of shale plays in the contiguous U.S. (Source: EIA) Note that this map is not comprehensive: there exist U.S. shale plays that are not shown on the map.

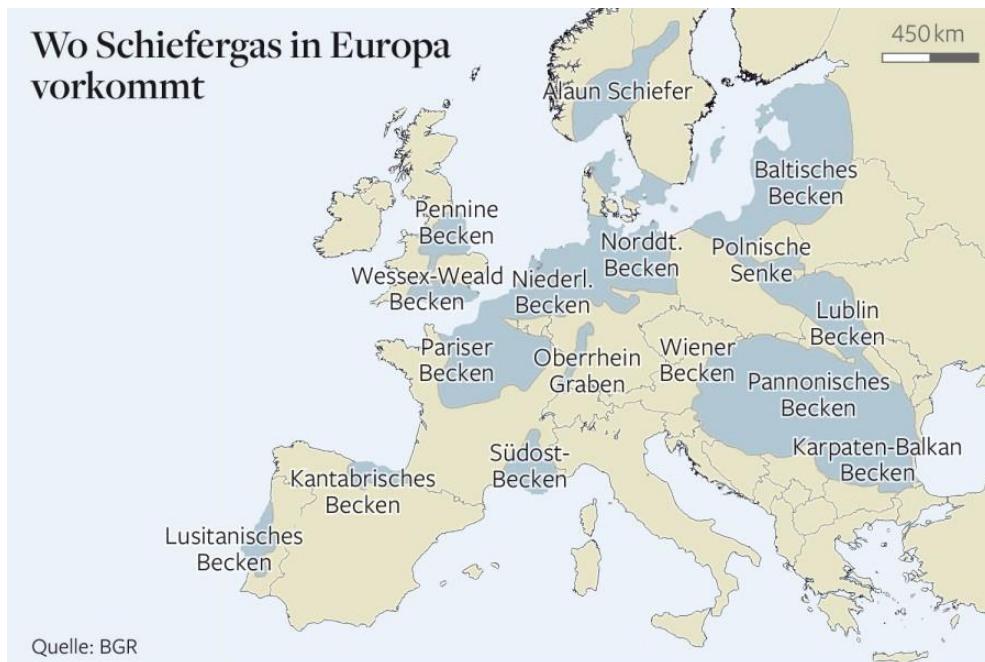


Figure 9: Map of potential shale gas sources in Europe. (Source: Die Welt, <http://www.welt.de/politik/deutschland/article113646643/Fracking-ist-auch-fuer-Deutschland-eine-Grosschance.html>; the source listed on the graphic is the Institute for Geosciences and Natural Resource, known in German as BGR or Bundesanstalt für Geowissenschaften und Rohstoffe)